EP0988876A1

Publication Title:

Method and apparatus for sampling remote data sources

Abstract:

A method of sampling, at a central location, data generated from a number of remote data sources. The method comprises:

a) causing those data sources with generated data to implement a local response function;
b) transmitting information from the central location to the remote data sources relating to the outcome of the local response function;
c) causing those data sources with generated data to determine whether the outcome of the local response function satisfies a predetermined relationship with the information transmitted from the central location, and, if it does, to transmit the generated data to the central location.

Data supplied from the esp@cenet database - http://ep.espacenet.com

(54) **Method and apparatus for sampling remote data sources**

(57) A method of sampling, at a central location, data generated from a number of remote data sources. The method comprises:

a) causing those data sources with generated data to implement a local response function;
b) transmitting information from the central location to the remote data sources relating to the outcome of the local response function;
c) causing those data sources with generated data to determine whether the outcome of the local response function satisfies a predetermined relationship with the information transmitted from the central location, and, if it does, to transmit the generated data to the central location.

Fig.1.

EP 0 988 876 A1
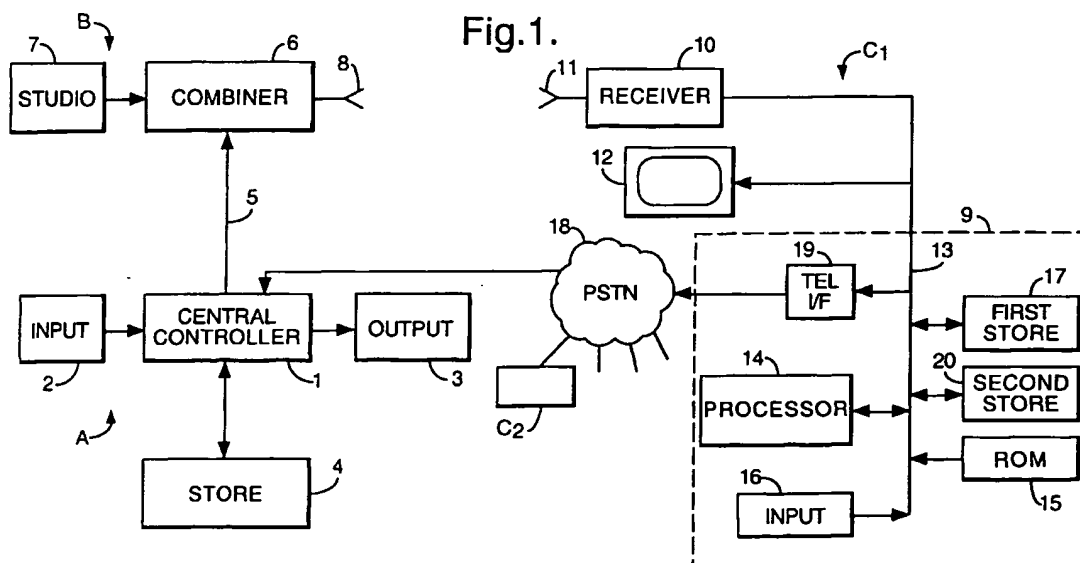
Description

[0001] The invention relates to a method and apparatus for sampling, at a central location, data generated from a number of remote data sources.

[0002] With the increasing ability to communicate at speed with a variety of remote data sources, there is an increasing need to find efficient systems for obtaining data from those sources for evaluation. A particularly important example of this is in game play applications in which a number of players at remote sites compete either directly or indirectly with each other in playing a game simultaneously. On completion of the game, the players wish to know as quickly as possible whether they have won or at least have a general indication of their level of success. The game may be solely locally generated, the game being played individually with scores being transmitted back to a central location for comparison or it may involve a degree of interactivity with data flow to and from the central location and the remote data sources during the playing of the game. Recently, games have been developed which relate to broadcast TV programs such as quiz shows which allow the remote users or players to compete with the same questions as in the quiz show.

[0003] As these applications become more popular, large numbers of remote data sources become involved in a single application or game. It is necessary to find a way of evaluating the game scores centrally as quickly as possible. The most straightforward approach is to require each remote data source to make contact with the central location individually, for example via the public switched telephone network or some other medium such as the Internet. However, it is conceivable that several thousand participants may be involved and the central location cannot cope with each of these supplying information substantially simultaneously. Receipt of all scores would take a long time or would require very expensive infrastructure that would only be used to its potential for a small percentage of the time together with the need for a significant degree of processing.

[0004] EP-A-0504267 describes a method of determining the winners of a game of skill without the need to input all the scores. Statistical sampling is used to upload scores from a small fraction of the remote players. Tentative winners are determined and a statistical curve is then downloaded to all the players and only those players who are equal or better than the winning score communicate their scores directly to the central location. This approach is based on the assumption that the central location can select a random pool of remote participants initially and request scores from them. However, in many situations, it is unlikely that the central location will know which remote data sources have participated in the game. In that situation, the techniques described in the prior art would not be suitable.

[0005] In accordance with the present invention, a method of sampling, at a central location, data generated from a number of remote data sources comprises:

a) causing those data sources with generated data to implement a local response function;
b) transmitting information from the central location to the remote data sources relating to the outcome of the local response function;
c) causing those data sources with generated data to determine whether the outcome of the local response function satisfies a predetermined relationship with the information transmitted from the central location, and, if it does, to transmit the generated data to the central location.

[0006] With this invention, retrieval of data is restricted firstly to those remote data sources which have generated data, for example participated in the game, which is determined locally. In addition, a sample of those remote data sources is selected using the local response function.

[0007] In general, the method is not used to determine a final game position for each remote data source which has participated but instead will enable the remote data sources to at least to determine whether or not the locally generated data falls within a particular range, for example an upper quartile.

[0008] In some cases, the data returned to the central location initially is provided from a sufficiently large pool of remote data sources to enable a threshold defining percentile data such as the 5% percentile to be identified. Typically, however, the method further comprises:

d) comparing the transmitted data at the central location to generate threshold data, and transmitting the threshold data to all the remote data sources which generated data, for comparison with the locally generated data, the remote data sources transmitting their generated data to the central location if it satisfies a predetermined relationship with the threshold data.

[0009] This provides an iterative process in which the threshold data can be refined until a situation is reached in which the desired percentile threshold has been found. This can then be communicated to the remote data sources enabling them to determine whether or not the locally generated data falls within that percentile.

[0010] In some cases, the number of remote data sources which respond initially will be either too few or too many and preferably the method further comprises determining the number of remote data sources which have transmitted data to the central location, and, if this differs from a desired number, transmitting new information relating to the outcome of the local response function and repeating step c), the new information being chosen to result in the number of local data sources transmitting data being closer to the desired number.

[0011] The information which is transmitted will depend on the form of the local response function and the processing which can be carried out locally. In a simple case, the local response function is a random number

generating function. In that case, the information which is transmitted can comprise a range of numbers selected from those numbers which could be generated by the random number generating function, step c) comprising determining whether the locally generated random number falls within the transmitted range. This is particularly convenient since the range can then be varied depending upon the number of remote data sources which respond. If there is a small number then the range can be increased and if there is a large number the range can be decreased. The range itself could be defined between upper and lower values which are transmitted or a single value could be transmitted defining an upper limit, the lower limit being zero.

[0012] In other cases, the information which is transmitted could be used locally to generate an outcome and not constitute the outcome itself.

[0013] The transmission of data from the central location to the remote users may be direct or indirect i.e. via multiple links/nodes etc.

[0014] The local response function is conveniently unrelated to the locally generated data since this enables its outcome to be more closely predicted. However, in other applications, the local response function could be related to the locally generated data and might comprise an algorithm which performs some function based on the locally generated data. This in turn could be a random number generating function.

[0015] As mentioned above, an important application of the invention is in the sampling of scores resulting from the playing of a game at the remote data sources. The game may be played in response to data transmitted from the central location together with locally generated instructions, for example as mentioned above in connection with a TV broadcast or the like. However, the game could also be wholly controlled locally and could even be played at a different time from the same game on other remote data sources providing the result of playing the game can be securely stored.

[0016] The invention is also applicable to other applications.

[0017] An example of a method and apparatus according to the invention will now be described with reference to the accompanying drawings, in which:-

Figure 1 is a schematic block diagram of the apparatus;
Figure 2 is a flow diagram illustrating operation of the central controller; and,
Figure 3 is a flow diagram illustrating operation of a remote unit.

[0018] The interactive broadcast network shown in Figure 1 comprises a game control system A at a central location and including a central controller 1 which will include a computer such as a PC operating a Windows based system, connected to an input device 2 such as a keyboard and/or mouse and the like and to an output

device 3 which may include a monitor and/or printer. A store 4 stores data relating to service functions and remote users, which can be accessed and amended by the central controller 1. The central controller 1 generates TV display signals and other control signals associated with various service functions on a land line 5 connected to a combining unit 6 of a TV broadcast system B. The combining unit 6 receives television broadcast signals from a studio 7 which, in the case of a live event, will have originated from outside broadcast cameras, and combines these with the signals on the line 5 so that they are transmitted simultaneously by a transmitter 8 to remote users or players C_1, C_2... The users will typically be remote not only from the system B but also from each other.

[0019] The signals supplied to the combiner 6 may be transmitted to the remote units within a vertical blanking interval (VBI) of the normal TV signal or on a separate radio FM-SCA channel or other data format such as a cable modem.

[0020] Other forms of transmission including satellite, cable and the internet may also be used to send signals to the remote users C.

[0021] Each remote user C_1, C_2..., only one shown in Figure 1, has a home or remote unit 9 constituting a "data source" connected to a television receiver 10 having an aerial 11 and a monitor 12. The home unit 9 includes an address/data bus 13 connected to the receiver 10, the bus 13 being connected to a microprocessor 14, a ROM 15 storing programme instructions for the processor 14, an input device 16 such as a keyboard or mouse, a first store (RAM) 17 for storing data supplied from the central controller 1, and a second signal store (RAM) 20 for storing data defining the identity of the remote unit 9 and the services to which the remote user has subscribed. Signals transmitted by the processor 14 can be communicated to the central controller 1 via a public switched telephone network 18 which is selectively accessed by a telephone interface unit 19 connected to the bus 13. Other media may be used for the return transmission including TV broadcast, cable, satellite and the Internet. In general the return signal medium will be different from the medium used to transmit to the remote user C.

[0022] The game control system A can generate data relating to a variety of games some of which may be associated with television broadcasts from the studio 7. For example, one game may allow remote users to predict the occurrence of certain events in a live event being broadcast, such as a live football match. In addition, the game control system A can generate signals to individual or groups of remote units which include data such as operating system upgrades and signals for enabling or disabling certain services.

[0023] These functions are described in more detail in EP 98302964.6 and EP 98301897.9 incorporated herein by reference.

[0024] Typically, on completion of a game, each re-

mote unit C will have a game score. For example, in the case of a quiz game, this may comprise the number of questions correctly answered. The present invention is concerned with the manner in which these scores can be analysed. Firstly, an initial sampling process is carried out partly under the control of the central controller 1 and partly under the control of the processor 14 in each remote unit C. Each remote unit C stores a local response function in its ROM 15, typically a random number generating function. In this example, it will be assumed that each random number generating function will generate a number in the range 1-10000. At the start of a sampling process, the central controller 1 generates a default call-in range or window (step 100, Figure 2) which, for example, could comprise the range of numbers 1-200. This range is transmitted (step 101) to all remote units C. If a remote unit C has participated in the game, the processor 14 will have performed the random number generating function (step 201) to generate a random number in the range 1-10000. This initial range may be preprogrammed or alternatively supplied to the remote units C at the beginning of a sampling operation as shown by step 200 in Figure 3. Following performance of the random number generating algorithm (step 201), the remote units C await the receipt of the active call-in window (step 202) from the central controller 1 (step 101).

[0025] If the remote unit C has participated in the game, upon receipt of the active call-in window, the processor 14 determines whether the locally generated random number falls within the active window (step 203). If it does, the processor 14 then returns the local score (step 204) to the central controller 1 using the normal return medium such as the PSTN 18. Alternatively, if the random number locally generated is not within the active window then the processor 14 determines whether it is currently operating in the sampling or iterative phase (step 205) and if in the sampling phase, processing returns to step 202.

[0026] Following transmission of the active call-in window in step 101, the central controller 1 then waits for a two minute period (step 102) and then reviews the response level, that is the number of remote units C which have responded because their locally generated random numbers fall within the active call-in window. The central controller 1 determines whether the response level is too low (step 103) and, if so, it increases the active call-in window size (step 104) and it is retransmitted in step 101.

[0027] For example, if the initial active call-in window was the range 1-200, this might be increased to 1-400.

[0028] If, however, the response level is too high (step 105), the active call-in window is reduced in size (step 106) and the new window size transmitted in step 101. Otherwise, the response level is considered acceptable and processing moves to step 107.

[0029] In this iterative phase the scores returned by the remote units are reviewed. In step 107, the central controller 1 selects the 100th best received score and this is transmitted (step 108) to all local units C as a threshold value. When the remote units receive the threshold value (step 206), this is compared with the local score (step 207) and if the score is greater than the threshold, the score is returned to the central controller 1. This return process involves waiting for a short random period (step 208), attempting to call the central controller (step 209), determining a successful connection (step 210) and, if successful, transmitting the score (step 211). If the connection is not successful, processing returns to step 206.

[0030] The central controller waits for a period of 45 seconds following transmission of the threshold in step 108 and determines whether any calls have been received (step 109). If they have not, this indicates that the top 100 scores have already been received (step 110) while if scores have been returned then the threshold needs to be reset and processing returns to step 107.

[0031] It is desirable for the players at the local units C to find out how they fared in relation to the rest of the playing population. It is not possible for the central controller 1 to transmit a position to each and every participant since not all local remote units will have called in. Following the scoring process, the central controller has a pool of scores from the remote users that have called in. If the size of this pool is increased with truly random scores (those not involved in the iterative scoring procedure) then the collection of scores could be used as a representative cross-section of the playing population's results. Details of this cross-section can be transmitted to the remote users allowing local resolution of each remote user's position relative to the rest of the playing population. This is implemented by dividing the ranked scores into 5% percentile bands. These 20 bands are transmitted to the remote users at the end of the scoring procedure. The local unit can then locally determine which percentile band the user falls into.

[0032] It should be noted that the various delays specified in Figures 2 and 3 are configurable and that for the sake of simplicity, Figure 2 ignores the situation in which no scores have been returned upon completion of the two minute period (step 102).

Claims

1. A method of sampling, at a central location, data generated from a number of remote data sources, the method comprising:

   a) causing those data sources with generated data to implement a local response function;
   b) transmitting information from the central location to the remote data sources relating to the outcome of the local response function;
   c) causing those data sources with generated

data to determine whether the outcome of the local response function satisfies a predetermined relationship with the information transmitted from the central location, and, if it does, to transmit the generated data to the central location.

2. A method according to claim 1, further comprising:
d) comparing the transmitted data at the central location to generate threshold data, and transmitting the threshold data to all the remote data sources which generated data, for comparison with the locally generated data, the remote data sources transmitting their generated data to the central location if it satisfies a predetermined relationship with the threshold data.

3. A method according to claim 2, wherein the predetermined relationship is satisfied if the locally generated data exceeds the threshold data.

4. A method according to claim 2 or claim 3, further comprising repeating step d) in response to the most recently received transmitted data until no more data is received at the central location.

5. A method according to any of the preceding claims, further comprising determining the number of remote data sources which have transmitted data to the central location, and, if this differs from a desired number, transmitting new information relating to the outcome of the local response function and repeating step c), the new information being chosen to result in the number of local data sources transmitting data being closer to the desired number.

6. A method according to claim 5, wherein the determination step is made upon completion of a predetermined time period.

7. A method according to any of the preceding claims, wherein the local response function is independent of the locally generated data.

8. A method according to claim 7, wherein the local response function is a random number generating function.

9. A method according to claim 8, wherein step b) comprises transmitting a range of numbers selected from those numbers which could be generated by the random number generating function, step c) comprising determining whether the locally generated random number falls within the transmitted range.

10. A method according to any of the preceding claims, wherein the remote data sources generate data as

a result of playing a game, the data comprising a game score.

11. A method according to claim 10, wherein the game is played in response to data transmitted from the central location and locally generated instructions.

12. A method according to claim 10 or claim 11, wherein the game is played in association with a TV broadcast.

13. A method according to any of the preceding claims, wherein the central location transmits to the remote data sources via a mass broadcast system such as terrestrial or satellite TV, a cable network or the Internet.

14. A method according to any of the preceding claims, wherein the remote data sources transmit to the central location via one of the public switch telephone network, the Internet or a dedicated communication line.

15. A method of operating a central station at the central location in a method according to any of the preceding claims, in which the central station transmits information from the central location to the remote data sources relating to the outcome of the local response function.

16. A method according to claim 15, when dependent on at least claim 2, wherein the central station compares the transmitted data received at the central location to generate threshold data and transmits the threshold data to all the remote data sources which generated data for comparison with the locally generated data.

17. A method of operating a remote data source in a method according to any of claims 1 to 15, in which if the remote data source has generated data, it performs a local response function, receives information transmitted from the central location relating to the outcome of the local response function, determines whether the outcome of the local response function satisfies a predetermined relationship with the information transmitted from the central location, and, if it does, transmits the generated data to the central location.

18. A data generating and sampling system comprising a central station and a number of remote data sources adapted to carry out a method according to any of claims 1 to 15.

19. A central station adapted to carry out a method according to claim 15 or claim 16.

20. A data source adapted to carry out a method according to claim 17.

5

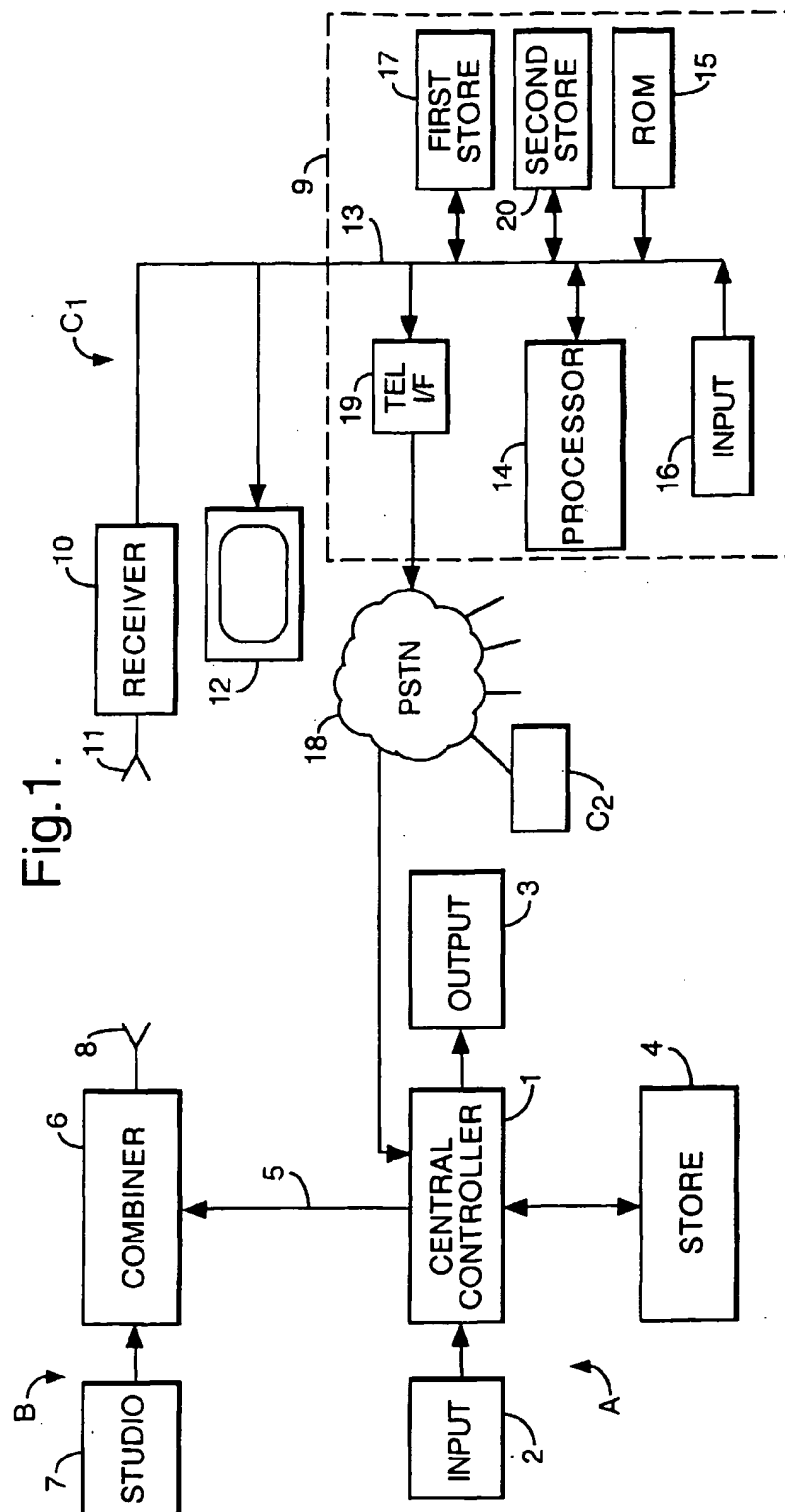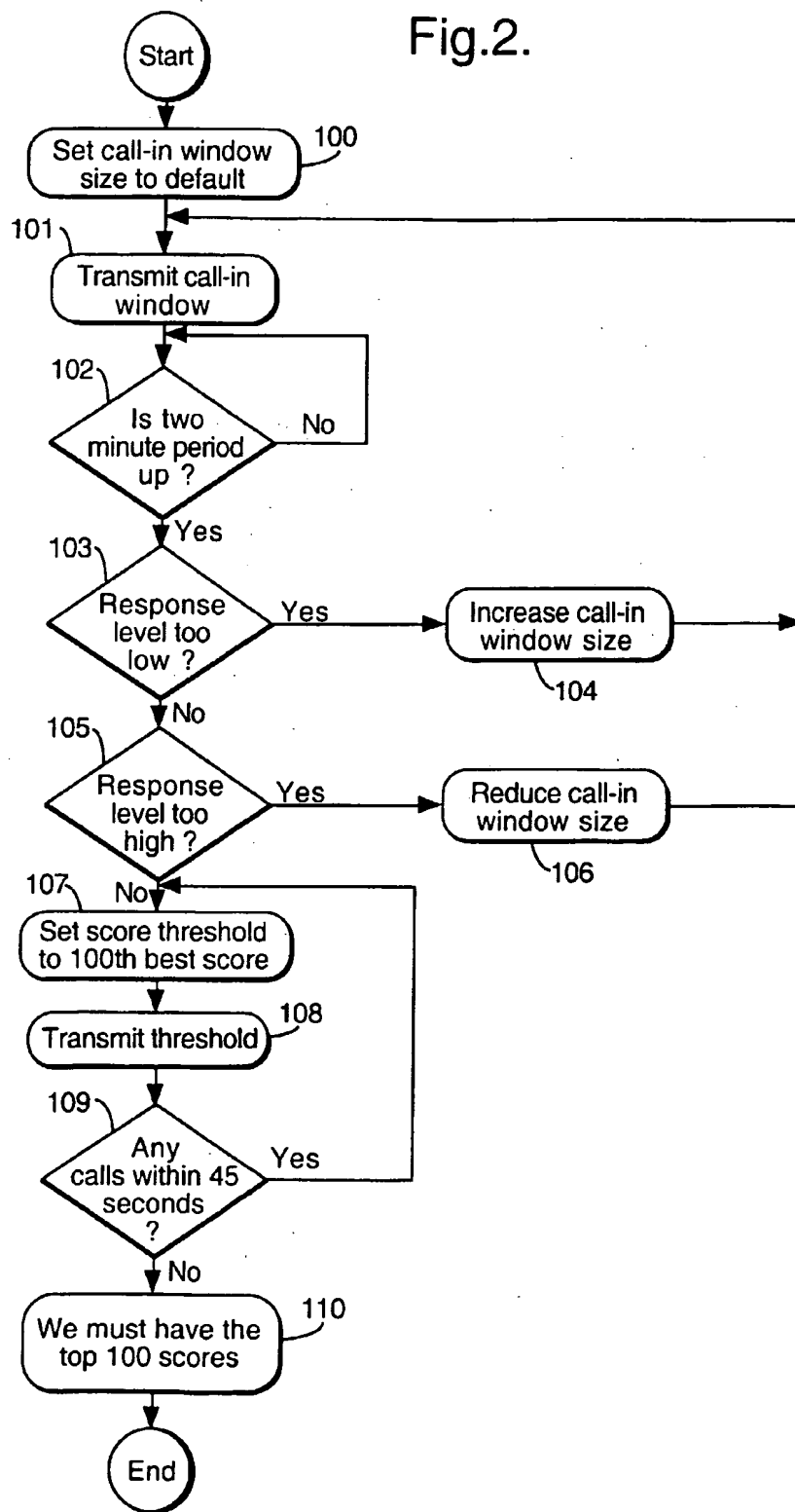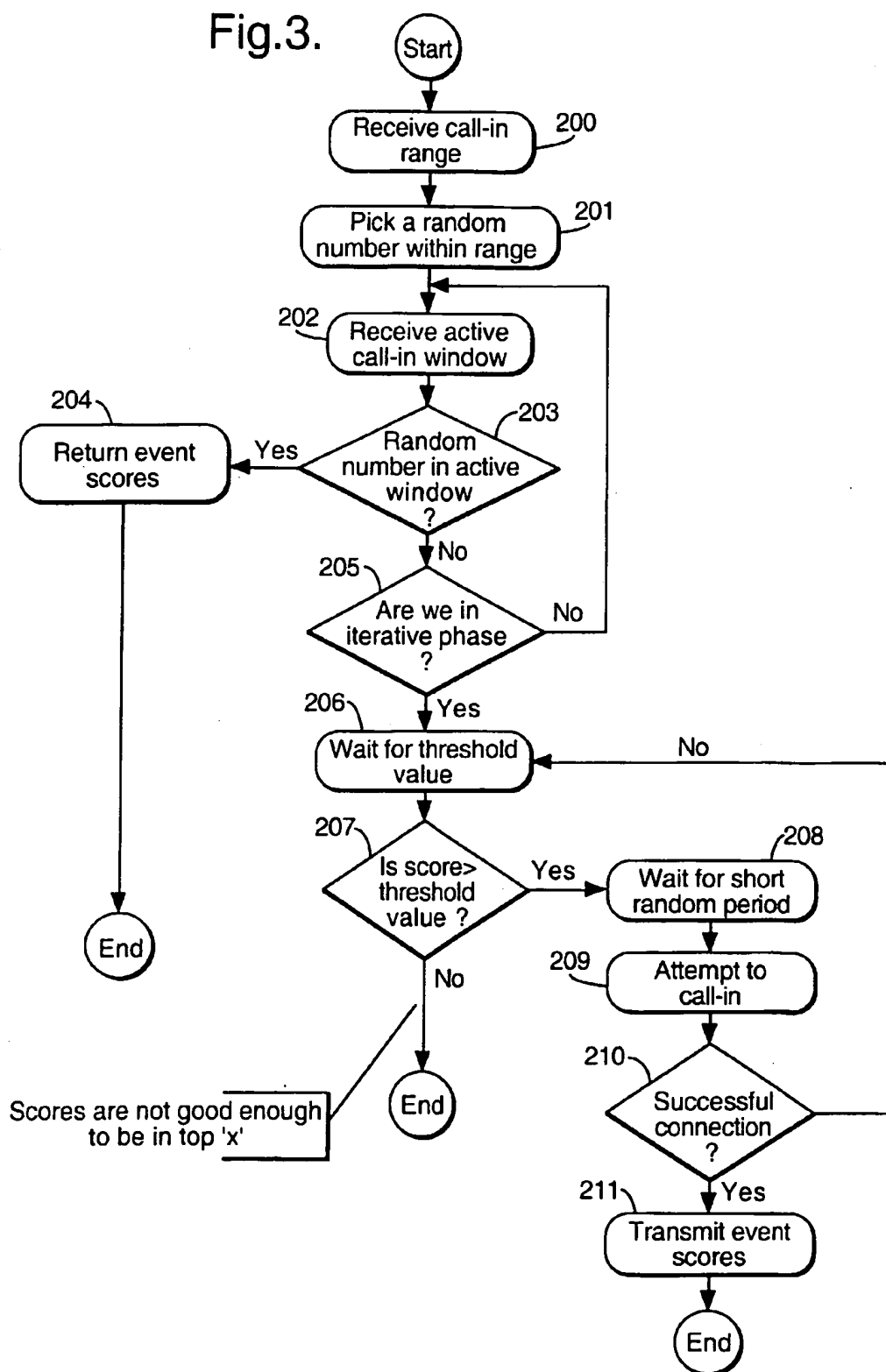*10*

15

20

25

30

35

40

45

50

55

Fig.1.

Fig.2.

```
        ( Start )
            │
            ▼
  ┌──────────────────────┐  100
  │ Set call-in window   │
  │   size to default    │
  └──────────────────────┘
            │
  101       ▼
  ┌──────────────────────┐
  │  Transmit call-in    │ ◄──────────────────────────────────┐
  │      window          │ ◄──────────────┐                   │
  └──────────────────────┘                │                   │
  102       │                             │                   │
            ▼                             │                   │
        ╱ Is two  ╲         No            │                   │
       ╱  minute   ╲ ──────────────────────┘                   │
       ╲  period   ╱                                           │
        ╲  up ?   ╱                                            │
            │                                                  │
            │ Yes                                              │
  103       ▼                                                  │
        ╱ Response ╲        Yes      ┌──────────────────┐      │
       ╱  level too ╲ ──────────────►│ Increase call-in │──────┘
       ╲    low ?   ╱                │   window size    │
        ╲         ╱                  └──────────────────┘
            │                              └ 104
            │ No
  105       ▼
        ╱ Response ╲        Yes      ┌──────────────────┐
       ╱  level too ╲ ──────────────►│  Reduce call-in  │──────┐
       ╲   high ?   ╱                │   window size    │      │
        ╲         ╱                  └──────────────────┘      │
  107       │ No                          └ 106                │
            ▼ ◄─────────────────────────────────────────────── ┘
  ┌──────────────────────┐
  │ Set score threshold  │
  │ to 100th best score  │
  └──────────────────────┘
            │
            ▼                  108
  ┌──────────────────────┐
  │  Transmit threshold  │
  └──────────────────────┘
  109       │
            ▼
        ╱   Any    ╲        Yes
       ╱ calls within╲ ─────────────┐
       ╲  45 seconds ╱              │
        ╲    ?      ╱ ──────────────┘
            │
            │ No
            ▼                  110
  ┌──────────────────────┐
  │  We must have the    │
  │   top 100 scores     │
  └──────────────────────┘
            │
            ▼
         ( End )
```

Fig.3.

Start

Receive call-in range — 200

Pick a random number within range — 201

202 — Receive active call-in window

204 — Return event scores ← Yes ← 203 Random number in active window ?

No

205 — Are we in iterative phase ? — No

Yes

206 — Wait for threshold value ← No

207 — Is score> threshold value ? — Yes → Wait for short random period — 208

No

End

Scores are not good enough to be in top 'x'

End

209 — Attempt to call-in

210 — Successful connection ?

211 — Transmit event scores ← Yes

End

EUROPEAN SEARCH REPORT

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	WO 98 07485 A (STEIN ADRIAN & LM) 26 February 1998 (1998-02-26) * page 1, line 15 - page 2, line 17 * * page 3, line 4 - line 15 * * page 10, line 15 - page 12, line 33 * * page 17, line 20 - line 24 *	1-5, 10-20	A63F9/22 H04H9/00
A	US 5 013 138 A (ROOSEN RAYMOND A ET AL) 7 May 1991 (1991-05-07) * column 1, line 53 - column 2, line 5 * * column 3, line 3 - line 15 * * column 4, line 28 - line 46 * * column 5, line 33 - column 6, line 2 *	1,7,8,15	
A	EP 0 745 412 A (TWO WAY TV LTD) 4 December 1996 (1996-12-04) * column 1, line 25 - line 43 * * column 3, line 45 - column 4, line 17 * * column 5, line 7 - column 6, line 15 *	1,13	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7) A63F H04H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	3 December 1999	Sindic, G

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.** EP 99 30 6628

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

03-12-1999

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
WO 9807485	A	26-02-1998	AU	3935397 A	06-03-1998
US 5013138	A	07-05-1991	EP	0277385 A	10-08-1988
			JP	63194257 A	11-08-1988
			US	4830941 A	16-05-1989
EP 0745412	A	04-12-1996	US	5813913 A	29-09-1998

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82